CLAIMS

1. A motor drive apparatus, comprising:

a first inverter (14) driving a first motor (M1);

a second inverter (31) driving a second motor (M2);

a DC power supply (B) outputting a DC voltage;

a voltage converter (12) boosting and supplying the DC voltage from said DC power supply (B) to said first and second inverters (14, 31), and down-converting and supplying the DC voltage from said first or second inverter (14, 31) to the side of said DC power supply (B);

a relay (SR1, SR2) connected between said DC power supply (B) and said voltage converter (12);

an electric load (20) connected between said relay (SR1, SR2) and said voltage converter (12); and

a control device (30) cutting off said relay (SR1, SR2) and switching control of said voltage converter (12) to voltage step-down control in response to detection of a fault in said DC power supply (B).

2. The motor drive apparatus according to claim 1, wherein said control device (30) controls said first and second inverters (14, 31) to cause a total sum of first energy at said first motor (M1) and second energy at said second motor (M2) to be zero, and cuts off said relay (SR1, SR2) when said electric load (20) and said voltage converter (12) are stopped.

3. The motor drive apparatus according to claim 2, wherein said control device (30) controls said first and second inverters (14, 31) to cause said first and second energies to be zero.

4. The motor drive apparatus according to claim 2, wherein said control device (30) sets a duty ratio with which a primary voltage of said voltage converter (12) corresponding to its voltage on the side of said DC power supply (B) is not greater than an upper limit, to switch the control of said voltage converter (12) to the voltage step-down control.

5. The motor drive apparatus according to claim 4, wherein said upper limit corresponds to a withstand voltage of parts of said electric load (20).

6. The motor drive apparatus according to claim 4, wherein said control device (30) sets a duty ratio with which said primary voltage falls within a range of an operating voltage of said electric load (20), to switch the control of said voltage converter (12) to the voltage step-down control.

7. The motor drive apparatus according to any of claims 2-6, wherein

the range of said operating voltage has a lower limit and said upper limit, and

when said primary voltage is lower than said lower limit, said control device (30) controls said first and second inverters (14, 31) to cause a total sum of said first energy and said second energy to be regenerative energy.

8. The motor drive apparatus according to claim 7, wherein said electric load (20) is a DC/DC converter (20) that converts and supplies the DC voltage from said DC power supply (B) to an auxiliary battery (21).

9. A hybrid vehicle drive apparatus (100) for driving a hybrid vehicle, comprising:

an internal combustion engine (60);

a first motor (M1) connected to said internal combustion engine (60);

a second motor (M2); and

a motor drive apparatus (B, SR1, SR2, 11, 14, 31, 30) driving said first and second motors (M1, M2),

said motor drive apparatus (B, SR1, SR2, 11, 14, 31, 30) including

a first inverter (14) driving said first motor (M1),

a second inverter (31) driving said second motor (M2),

a DC power supply (B) outputting a DC voltage,

a voltage converter (12) boosting and supplying the DC voltage from said DC power supply (B) to said first and second inverters (14, 31), and down-converting and supplying the DC voltage from said first or second inverter (14, 31) to the side of said DC power supply (B),

a relay (SR1, SR2) connected between said DC power supply (B) and said voltage converter (12),

an electric load (20) connected between said relay (SR1, SR2) and said voltage converter (12), and

a control device (30) cutting off said relay (SR1, SR2) and switching control of said voltage converter (12) to voltage step-down control in response to detection of a fault in said DC power supply (B),

said control device (30) driving said first and second inverters (14, 31) so as to drive said second motor (M2) by electric power generated by said first motor (M1) in accordance with a running mode of said hybrid vehicle.

10. A computer readable recording medium recorded with a program for causing a computer to perform control of a motor drive apparatus (B, SR1, SR2, 11, 14, 31, 30) in the event of a fault in a DC power supply (B),

said motor drive apparatus (B, SR1, SR2, 11, 14, 31, 30) including

a first inverter (14) driving a first motor (M1),

a second inverter (31) driving a second motor (M2),

said DC power supply (B) outputting a DC voltage,

a voltage converter (12) boosting and supplying the DC voltage from said DC power supply (B) to said first and second inverters (14, 31), and down-converting and supplying the DC voltage from said first or second inverter (14, 31) to the side of said DC power supply (B),

a relay (SR1, SR2) connected between said DC power supply (B) and said voltage converter (12), and

an electric load (20) connected between said relay (SR1, SR2) and said voltage converter (12),

said program causing the computer to perform

a first step of detecting a fault in said DC power supply (B),

a second step of cutting off said relay (SR1, SR2) in response to detection of the fault in said DC power supply (B), and

a third step of switching control of said voltage converter (12) to voltage step-down control in response to cutting off of said relay (SR1, SR2).

11. The computer readable recording medium recorded with a program for causing a computer to perform control according to claim 10, wherein

said second step includes

a first sub-step of controlling said first and second inverters (14, 31) to cause a total sum of first energy at said first motor (M1) and second energy at said second motor (M2) to be zero,

a second sub-step of stopping said voltage converter (12),

a third sub-step of stopping said electric load (20), and

a fourth sub-step of cutting off said relay (SR1, SR2) after completion of said first, second and third sub-steps.

12. The computer readable recording medium recorded with a program for

causing a computer to perform control according to claim 11, wherein said first sub-step causes said first and second energies to be zero.

13. The computer readable recording medium recorded with a program for causing a computer to perform control according to any of claims 10-12, wherein

said third step includes

a fifth sub-step of calculating a duty ratio for setting a primary voltage of said voltage converter (12) corresponding to its voltage on the side of said DC power supply (B) to not greater than an upper limit, and

a sixth sub-step of controlling said voltage converter (12) based on said calculated duty ratio.

14. The computer readable recording medium recorded with a program for causing a computer to perform control according to claim 13, wherein said fifth sub-step calculates the duty ratio with which said primary voltage falls within a range of an operating voltage of said electric load (20).

15. The computer readable recording medium recorded with a program for causing a computer to perform control according to claim 13, wherein

the range of said operating voltage has a lower limit and said upper limit, and

said third step further includes

a seventh sub-step of determining whether said primary voltage is not greater than said lower limit, and

an eighth sub-step of controlling said first and second inverters (14, 31) to cause a total sum of said first and second energies to be regenerative energy when said primary voltage is not greater than said lower limit.